IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE
PATENT APPLICATION

5   .   <u>TELEPHONY CALL CONTROL USING A PERSONAL</u>

<u>DIGITAL ASSISTANT WITH A WIRELESS LINK</u>

<u>BACKGROUND OF THE INVENTION</u>

10

1. <u>Field of the Invention</u>

The invention relates to telephony call control
and to personal digital assistants (PDAs). More
particularly, the invention relates to methods and
15   apparatus for telephony call control using a personal
digital assistant with a wireless link and providing a
mechanism by which a wireless phone and PDA device may
operate in a coordinated way to provide complex telephony
features.

20

2. <u>Brief Description of the Prior Art</u>

For many years now it has been common to
control a telephone system with a personal computer.
This technology is known as computer telephone
25   integration or CTI. Typical applications include speed
dialing, caller identification, call forwarding, voice
mail, interactive voice response, etc.

In order for a worker to take advantage of
30   these features, the worker needs a computer coupled to a
telephone or a PBX and the appropriate software. This is
usually not a problem for a worker who spends the
majority of the workday at the same desk or work station.
Certain types of work, however, require that the worker
35   move about frequently. For example, medical workers in a
hospital, law enforcement workers, retail sales

supervisors, etc. all need to move about frequently. Communications with mobile workers such as these is effected with wireless devices such as pagers and cell phones. However, these devices do not offer the

5   flexibility of CTI.

Recently personal digital assistants have been provided with wireless capabilities and some cell phones have been provided with features of personal digital

10   assistants.

SUMMARY OF THE INVENTION

15   It is therefore an object of the invention to provide a CTI application which serves the mobile worker by extending the features of a typical PBX to the user of a cell-phone and PDA.

20   It is also an object of the invention to provide a wireless device which has CTI capabilities.

It is another object of the invention to provide a low cost CTI solution for the mobile worker.

25

It is yet another object of the invention to provide a CTI solution of the mobile worker which is easy to implement.

30   It is another object of the invention to provide a system for a mobile worker to control telephone calls in real time.

It is still another object of the invention to

35   provide a CTI system which is rich in features.

It is yet another object of this invention to provide a system wherein a cell phone is used in conjunction with a PDA to replace the functionality of a handset and desktop display and button array.

5

In accord with these objects which will be discussed in detail below, a first preferred embodiment of the invention includes a computer coupled to a CTI capable telephone and wireless gateway/router, and a

10 personal digital assistant with wireless capabilities or a cell phone with computing capabilities. The computer is programmed with CTI software and with mobility server software. The personal digital assistant with wireless capabilities or cell phone with computing capabilities is

15 programmed with mobility client software which allows it to interface with the CTI application running on the computer.

A second preferred embodiment of the invention

20 includes a mobility server coupled to a PBX and to a wireless gateway/router, and a personal digital assistant with wireless capabilities or a cell phone with computing capabilities. The mobility server uses a call control API or "fictitious telephone interface" to provide the

25 server function for multiple users. In particular, the mobility server controls multiple remote port H.323 clients and virtual H.323 clients.

The clients and the server preferably

30 communicate via a wireless IP network, either LAN or WAN. In either case, the wireless link need not be broad band since only short messages will be transmitted. In the case of a LAN, IEEE 802.11b wireless networking may be a cost effective solution. In the case of a WAN, data

35 services such as CDPD or GPRS which are part of the digital cellular network may provide the best solution.

According to the invention, the server monitors
one or more phone numbers associated with each client.
When a call comes in, the server immediately notifies the

5   client, preferably by including caller identification.
The client then has several options. The client can
direct the server to transfer or forward the call to a
nearby desk phone. This can also be accomplished by
parking the call in a system slot and by retrieving the

10   call with a nearby desk phone, thus not needing to know
the number of the desk phone. Otherwise, the client can
have the call forwarded to another telephone number. The
client can also redirect the call to voicemail or a
personal messaging system.

15

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a high level block diagram of a first
preferred embodiment of the invention;

20

FIG. 2 is a high level block diagram of a
second preferred embodiment of the invention;

FIG. 3 is a high level flow chart illustrating

25   the basic functions of the invention;

FIG. 4 is a sample screen display on a personal
digital assistant illustrating the information and
options presented to the mobile worker; and

30

FIG. 5 is a sample screen display on a personal
digital assistant after one of the options for call
processing has been chosen.

5

DETAILED DESCRIPTION

Turning now to Figure 1, a first preferred
embodiment of a system 10 according to the invention
5   includes a computer 12 coupled to a CTI capable telephone
14 and wireless gateway/router 16, and a personal digital
assistant 18 with wireless capabilities or a cell phone
with "always-on" wireless data and computing capabilities
(not shown). In this example, the telephone 14 is
10   coupled to a PBX 20 which is coupled to the PSTN 21 which
services other subscribers, e.g. 23 and 25. The personal
digital assistant 18 is coupled to the computer 12 by a
wireless network 17 created by the wireless
gateway/router 16. The connection between the computer
15   12 and the CTI capable phone 14 is preferably via a
serial link, USB (universal serial bus), or a short range
wireless link such as Bluetooth.

The CTI capable telephone 14 preferably
20   includes support for caller ID, call transfer, and
conference calling which are controllable by the computer
12 via a call control API. The computer 12 is equipped
with CTI driver software (available from the telephone
manufacturer) and with mobility server software
25   (described in more detail below with reference to Figure
3). The personal digital assistant 18 is programmed with
mobility client software which allows it to interface
with the CTI application running on the computer 12. The
client software is preferably written in a high level
30   language such as C++, Java or JavaScript. The client
software is a "thin client" which is essentially network
communication software which extends the user interface
of the CTI application running on the server computer 12.

35   A second preferred embodiment of a system 110
according to the invention includes a mobility server 112

coupled to a PBX 120 and to a wireless gateway/router
116, and a personal digital assistant (not shown) with
wireless capabilities or a cell phone 118 with "always-
on" wireless data and computing capabilities. The

5   mobility server 112 uses a call control API or
"fictitious telephone interface" to provide the server
function for multiple users. In particular, the mobility
server 112 controls multiple remote port H.323 clients
and virtual H.323 clients. According to a preferred

10   embodiment, the server 112 is preferably a Siemens
HiPath™ Teleworking Server. In this example, the PBX 120
is also coupled to the PSTN 121 which services other
subscribers, e.g. 123 and 125.

15   In either of the preferred embodiments
described above, the cell phone 18 or 118 may be replaced
with a combination device (not shown) comprising a PDA
(not shown) and a cell phone 18 or 118. In such a
combination device, the PDA and cell phone may be

20   physically integrated, yet logically operating
separately. If a PDA is used in conjunction with a cell
phone (whether or not they are physically integrated),
the PDA and cell phone may communicate, for example by
way of call control API or Bluetooth, to provide

25   additional functionality, such as using the PDA to
provide greater control over the cell phone's features.
Examples of such features that could be controlled by the
PDA are the cell phone speakerphone and volume control.

30   The server 112 preferably includes support for
caller ID, call transfer, and conference calling which
are controllable by the API of the server 112. The cell
phone 118 with computer capability is programmed with
mobility client software which allows it to interface

35   with the server 112. The client software is a "thin
client" which is preferably written in a high level

language such as C++, Java or JavaScript. The client
software is essentially network communication software
which extends the user interface of the server 112. The
communication protocol between the client and server is
5   designed so that the same client may interface to either
preferred embodiment of the server.

The clients 118 and the server 112 preferably
communicate via a wireless IP network 117, either LAN or
10   WAN. In either case, the wireless link need not be broad
band or "voice quality" since only occasional short
messages will be transmitted. High degrees of jitter and
delay can be tolerated. TCP protocol is used to ensure
no loss of messages. In the case of a LAN, IEEE 802.11b
15   wireless networking may be a cost effective solution. In
the case of a WAN, CDPD or GPRS data services, provided a
public carrier may provide the best solution. SMDS
(short message delivery service) of the digital cellular
network may also provide a solution.
20

Turning now to Figure 3, according to a
preferred embodiment of the invention, the server
monitors, at 200, one or more phone numbers associated
with each client. When a call comes in as determined at
25   202, the server immediately notifies the client at 204
via the wireless network, preferably by including caller
identification information, and waits at 206 for client
input. Preferably, if no client input is received within
a preset time, a default action is performed at 208. The
30   default action would likely be a redirection to a
voicemail system. The client may also have a set of user
defined rules that instruct how to handle calls from
specific individuals, without user intervention. For
example, a call from a specific number ("my boss") can be
35   automatically be forwarded or transferred to "my current
location", the most recent phone number specified by the

client.

Once notified at 204, the client then has
several options. As mentioned above, the notification
5   preferably includes caller identification information so
that the client can use that information to decide which
option to choose in further processing the call.

One option for the client is to direct the
10   server to transfer the call to a nearby phone. One
manner of redirecting a call is to enter a phone number
as shown at 210. This could also be setup as the default
at 208. When a forward number is entered, the call will
be placed on hold and played an announcement that the
15   call is being transferred.
        The client can also direct the server to
transfer the call to any nearby phone by parking the call
at 212 in a system slot and by retrieving the call with a
nearby phone, thus not needing to enter or even know the
20   number of the phone used to retrieve the call. For
example, when a call is parked at 212, an announcement
will be played to the caller indicating that the call is
being transferred. In addition, music on hold or other
audio information may be played to the caller while the
25   client calls in to retrieve the call. When the client
calls a preassigned phone number and, optionally enters
the proper code, the system slot is coupled to the
incoming client call and the parties are connected.

30   Another option available to the client is
illustrated at 214 where the client can have the call
redirected to voicemail or a personal messaging system.

Referring now to Figures 4 and 5, those skilled
35   in the art will recognize a typical personal digital
assistant 300 having a touch screen stylus interface.

According to the invention, when a call is received by
the call server for this particular client, caller ID
information 302 is displayed on the screen of the
personal digital assistant 300 together with a menu 304
5   of processing options. An audible signal (not shown) is
also activated. If the client chooses the "Forward to #"
option, a virtual keypad 308 with an instruction prompt
306 is displayed as shown in Figure 5. The client may
then enter the forward number with the stylus (not
10   shown).

The other options "Park and Call", "Send to
voicemail", and "Send to PMS" (personal messaging system)
might not need further input from the client. However,
15   if they did, an interactive screen like the one shown in
Figure 5 would be provided.

There have been described and illustrated
herein methods and apparatus for telephony call control
20   using a personal digital assistant with a wireless link.
While particular embodiments of the invention have been
described, it is not intended that the invention be
limited thereto, as it is intended that the invention be
as broad in scope as the art will allow and that the
25   specification be read likewise. It will therefore be
appreciated by those skilled in the art that yet other
modifications could be made to the provided invention
without deviating from its spirit and scope as so
claimed.